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American ferns — VIII. A preliminary review of the North American Gleicheniaceae

Lucien Marcus Underwood

The oldest known of the American representatives of this family was figured by Plumier in 1703 (*plate 28*) and this plate was taken by Linnaeus in 1753 as the type of *Pteris dichotoma* and in 1759 as the type of *Acrostichum furcatum*. After various vicissitudes this oldest species of the genus — probably because of its rarity, for it grows, apparently, only in the extinct craters of the Lesser Antilles — passed into forgotten synonymy. The first recognition of generic value in the family was made in 1793, by Sir J. E. Smith, who based the genus *Gleichenia* on *Onoclea polypodioides* of Linnaeus, an Australian species. This was followed in 1804 by Willdenow's genus *Mertensia*, based on five pectinate species, part of which were American. This generic name could not hold because of the earlier *Mertensia* Roth (1793) in the *Boraginaceae;* and this fact was noted as early as 1806, by Bernhardi, who then established the genus *Dicranopteris* in its place, basing his name on *Polypodium dichotomum* Thunb. from Japan.*
It is this genus to which our American species pertain.

Robert Brown published *Platyzoma* in 1810 with a single Australian species, and in 1861 Mettenius established *Stromatopteris* with a single species from New Caledonia.† We believe that all of these represent valid genera and may be separated by the following tabulated characters:

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* DICRANOPTERIS Bernh. Neues Jour. Bot. Schrad. 1^2: 38. 1806. In the face of this publication Willdenow still used *Mertensia* in 1810 as Swartz had done before him in the first *Synopsis Filicum* (1806). Raddi, Desvaux, Brackenridge, and Sturm all published under this name, and Fée continued to recognize *Mertensia* and publish species in the genus until 1869. In 1856 Hasskarl again recognized the fact that *Mertensia* for a fern genus was preoccupied and substituted the name *Mesosorus* for it.

† It is a curious coincidence that *Platyzoma*, established by an Englishman, is reduced to synonymy by recent German writers, while *Stromatopteris*, established by a German and still maintained by them, is not accepted in the *Synopsis Filicum* of Hooker & Baker.

Stems simply pinnatifid or pinnate.*	
Sori borne on the ends of ordinary veins ; rootstocks creeping.	PLATYZOMA.
Sori borne on horseshoe-shaped receptacles ; rootstocks erect.	STROMATOPTERIS.
Stems pseudo-dichotomous, once to many times forking.	
Sori borne on the ends of veins ; segments in the form of rounded lobes.	GLEICHENIA.
Sori borne dorsally on the veins or at a fork ; pinnae pectinate.	DICRANOPTERIS.

Of the above genera *Dicranopteris* is found in both the Old World and the New, extending in range from Japan to the Straits of Magellan. The other genera are confined to the southern hemisphere of the Old World. As stated above *Platyzoma* and *Stromatopteris* are monotypic, while *Gleichenia* has several species ranging from South Africa to Java and Australia.† The species of *Gleichenia* are frequent in cultivation in the conservatories of the Old World, but we have never seen any of the species of *Dicranopteris* in cultivation anywhere. The development of the sexual stage is only incompletely known, having been partially studied by Rauwenhoff,‡ but in Jamaica at least the early stages of several species are abundant on the clay banks from germinating spores to young sporophytes in all stages. The young stages of the various species could profitably be studied at the Cinchona laboratory, as all four of Diels' sections of the genus are abundantly represented within easy reach of that station.

Some of the larger members of the genus *Dicranopteris* form thickets so deep that we have seen tunnels cut through them in which men could walk erect, and once, at Tweedside, Jamaica, Mr. Maxon and the writer walked for more than half a kilometer on the bent-down branches of tangles that had overgrown an unused bridle-path, our guides, tired of cutting paths, forcibly throwing themselves upon the tangles and we following on the springing elastic masses never once touching the ground and often a meter or more above it. Nearly all the species show a pseudodichotomy, and in each fork the growing axis remains in the form of a dormant bud ready to spring up as soon as the necessities of the plant demand additional foliar expansion. The accompanying diagram

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*One of the South American species of the genus *Dicranopteris* has simple pectinate stems. Too little is known of the species, however, to base any conclusions on it.

† In *Synopsis Filicum* six species of § *Eugleichenia* are recognised, but there are others.

‡ N. P. W. RAUWENHOFF: La génération sexuée des Gleicheniacées. Arch. Néerl. 24: 157–231. *pl. 4–10.* 1890.

will illustrate the normal progress of one of the species, and it must be noted that in the main the diagram represents the plant at its simplest condition except at one point (above *c′*) where a bud of the second order of forks is represented as producing a lateral extension of the plant, a condition possible at every one of the secondary and tertiary forks.

On account of these features some of the larger species of *Dicranopteris* do not lend themselves to what has facetiously been called "lie flat botany" since they occupy too much space in every direction to be easily reduced to the limits of the ordinary herbarium sheet, and still reveal the distinctive characters of the species. Neither "rough dry botany" nor "bottle botany" will succeed much better in transferring the distinctive characters of the larger species to the laboratory, and photography, while revealing habit in the mass, can add little to the details that go to separate technically one species from another. They must be lived with in their native haunts to impress firmly their distinctive characters. The ordinary field botanist, without knowing the necessities of the case, meets a proposition in the form of a *Dicranopteris* tangle, and simply breaks off one of the small terminal portions of possibly a fork of the second or third order with no hint of the main stem or habit of growth and brings it to some herbarium for preservation as a stumbling-block for the future. Such material unfortunately formed the basis for some of the "type specimens" of the genus and they can only be elucidated and correlated after extensive study of the plants in the field. Field-work of an intelligent character alone will ever disentangle the muddles in this genus. The *hortus siccus* will furnish some of the types but they must be interpreted by the field study in their respective type localities.

The terminology of the parts of these peculiar plants requires special notice and can best be explained by reference to the diagram (FIGURE 1). We commence with a young simple upright branch* *W*. This normally forks twice, producing a bud at *x′*

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* This upright branch from the creeping rootstock is circinate when young and is apparently homologous with the "frond" or leaf of the ordinary fern. Like the analogous case in some of the *Lygodieae* it is utterly impractical to use such a terminology here in descriptive work. It would be particularly absurd to speak of such a tangle as we have mentioned above as "leaves" or "fronds" and yet such they appear to be morphologically.

and also at *a′a′* ; at the latter points we may have pairs of pectinate pinnae simply (as shown on the right) or in some species we may have a second forking (as shown on the left), or in still other species this may be continued still further. Each species when normally mature appears to have a definite limit to the number of successive forkings of the same members. So far the problem is simple, but see what happens later. At some period the bud at

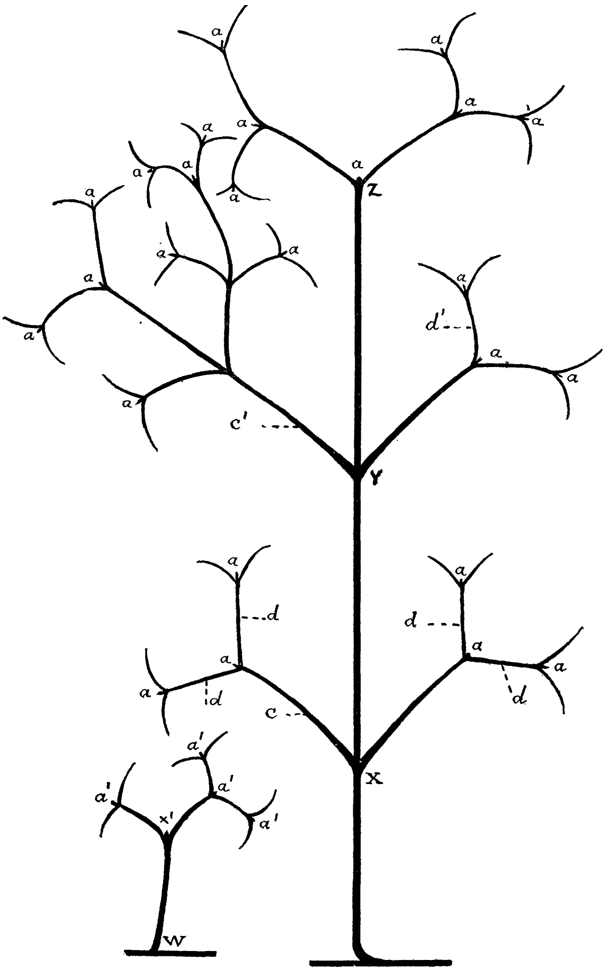

FIG. 1. Diagram of method of branching in *Dicranopteris*.

x' unfolds and (*cf.* larger figure) a second fork is produced at *Y* which by successive forkings duplicates the simple condition first observed. The system of forks at *Y* may be distinguished from those below as *forks of the second order.* From *Y* a terminal bud may produce later a *fork of the third order* (*Z*) and its terminal bud may continue the process as long as the tissue of the main stem retains the power to convey nourishment. Even this condition is comparatively simple, if it would remain so, as it does in certain species; but in others, buds everywhere developed at the lateral forks as at *a, a, a, a,* may unroll and produce an interminable array of complications. A moderate example of this is shown at the left-hand fork above *Y*; from this simple example it will not be difficult to imagine the possibilities of complication arising in a vigorous upright stem. The primary branches at *c, c,* may be called the *primary internodes;* at *d, d, d, d,* we have the *secondary internodes,* and so on through the entire series of the pseudo-dichotomy.

In the field it is of prime importance to get the primary fork in a normal condition; in it the characters of the bud-scales and the extent of the decurrence of the segments on the secondary and primary internodes is of great importance. Often these are both naked except for a casual stipule-like segment at the bud itself; in others the secondary is pectinate like the upper pinnae while the primary is naked; in others still the primary is pectinate on the inner side or in some species on both sides; so far as we have been able to see, these characters are fairly constant. One species (*D. pectinata*) presents a modification of this method of forking, the alternate forks producing merely a pair of pectinate pinnae, while the opposite one produces a second fork of which the alternate internode again produces a pair of pinnae, while the other goes on as before, thus forming an apparently zigzag axis and withal most graceful sprays, as the species is vine-like and often reaches a length of several meters.

Hooker and Baker recognized twenty-one species in their *Gleichenia* § *Mertensia* * (which is *Dicranopteris*) eight of which are exclusively American and two others are regarded as common to the tropics of both hemispheres, while the other eleven are exclusively Old-World species ranging from Japan and Hawaii to Tasmania and South Africa. Strikingly in contrast with this treatment is the arrangement given by Sturm of the Brazilian species,* of which he describes twenty-five; almost half of which (twelve) are reduced by Hooker and Baker under the single species, *Gleichenia pubescens*, with their characteristic lack of recognition of specific characters. Sturm's treatment, although nearly a half century away from the present, is the only critical and reliable one the American species have ever received, but concerns the South American species only. The species extending into Mexico and the West Indies have never received special attention, but their treatment has usually been that of *Synopsis Filicum*, in which the species are massed under four names as follows:

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* *Synopsis Filicum* ed. 2. 12, 15, and 449. 1874. Besides this two of Mettenius' species published in 1864 are included in the Index and referred to p. 449 of the text, but no mention of them occurs on that page or elsewhere in the work.

1. *Gleichenia longissima* Blume. (Type from Java!)

2. *Gleichenia pubescens* H. & B. (Type from Venezuela and never examined by the authors of *Synopsis Filicum*!)

3. *Gleichenia pectinata* Presl. (Type from Caracas, Venezuela; a common tropical American species.)

4. *Gleichenia dichotoma* Willd. (Type from Japan!) †

The four categories which these tangles typify were made to stand for four sections of the genus by Diels,‡ and some of them on account of differences in spore characters, have been thought worthy of higher rank.§

1. Of the four tangles mentioned above, the first was founded on a Javan plant, and represents a large group of species, two of

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* *Flora Brasiliensis* 1^1: 219–238. 1859.

† We have now no reason for believing that any species are common to the Old World and the New.

‡ *Die natürlichen Pflanzenfamilien* 1^4: 353–355. 1900.

§ Spore characters, except in a few genera, have never been considered in separating ferns specifically or generically. And yet we have two very distinct types of spore that appear to be somewhat fundamentally connected with the division of the spore mother-cell. One of these is the ordinary "reniform" or diplanate type which in reality is simply a quarter of a sphere divided axially and rounded on the sharp edges; the other, producing the so-called "sphaero-tetrad" or triplanate type, is formed by a division into 4's radiating from the center of the sphere with subsequent rounding of the edges. It would be interesting to know if the gametophyte bears any relation to this diverse origin of the spore.

which are found in the American tropics and a considerable number of species are widely distributed in the Old World.* The members of this group are distinguished by forming a single fork, each branch of which develops directly into a long bipinnate portion; as in the other sections the bud at the fork may develop into forks of the second and third orders forming an indefinite growth at the end of the axis. This group forms the section *Diplopterygium* of Diels.

2. The species of the second group, which form the section *Holopterygium* of Diels, have the characteristic forking indicated in FIGURE 1, with the segments decurrent on the nodes sometimes even to the primary ones. It was in this section that Sturm characterized a dozen South American species in 1859, and a resurvey of the same area at the present time would probably double that number; this work we hope later to be able to accomplish when the types in European herbaria have been studied still further, for without this no progress is possible. Most of the West Indian and Mexican species have been confused with *Gleichenia bifida* and *G. pubescens*, both originally described from South America, but a study of type material has convinced me that neither of these species occurs in present collections north of Panama. This is strictly in accord with the conclusion reached long ago by

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* Among other members of this group the following species submerged by reduction to synonymy, which we have studied at Kew and Berlin, we regard worthy of specific recognition:

Dicranopteris glauca (Thunb.).

Polypodium glaucum Thunb.; Houtt. Nat. Hist. **14**: 177. 1783. (Type from Japan.)

Dicranopteris glabra (Brack.).

Mertensia glabra Brack. Wilkes Expl. Exp. **16**: 292. 1854. (Type from Hawaii.)

Dicranopteris gigantea (Wall.).

Gleichenia gigantea Wall. Cat. n. 157. 1827 (*nomen nudum*); Hook. Sp. Fil. **1**: 5. *pl. 3 A.* 1844. (Type from Nepal.)

Dicranopteris longissima (Blume).

Gleichenia longissima Blume, Enum. Pl. Jav. 250. 1828. (Type from Java.)

Dicranopteris arachnoides (Hassk.).

Mertensia arachnoides Hassk. Jour. Bot. Hook. **7**: 322. 1855. (Type from Java.)

It is more than likely that other species of this section are confused in European herbaria, particularly with *D. gigantea* and *D. arachnoides* of the above list.

Sturm, who showed that the extension of range of *G. pubescens* at least was southward from its type locality rather than northward. Recently Dr. Christ has delimited a number of Costa Rican species, unfortunately with very poorly prepared material and probably without due reference to the species of South America. A number of his species have been re-collected in excellent specimens by Mr. Maxon, but much more field work in that prolific region will be necessary before we reach the end of our knowledge of the range of species. We have separated thirteen species in this section with three others still in the position of *species inquirendae.*

3. The section *Acropterygium* of Diels is characterized by bearing no segments on any of the internodes, the branches all terminating in a single pair of pinnae. To this section belongs *D. pectinata,* of wide distribution, one of the most graceful of the genus.*

4. The last section, *Heteropterygium* of Diels, is most peculiar of all in its branching. As in the last section there are no decurrent segments, but after the second forking and each succeeding one, a branch is deflected downwards on either side of the fork so as to make an angle of about the same degree of aperture as the fork itself. These deflected pinnae may be nearly as large as the regular pinnae of the plant or, in other species, may be reduced to a simple pinnule only slightly larger than the ordinary segments of the pinnae of the same plant. The type of this section as well as of the genus *Dicranopteris* is the plant described by Thunberg from Japan as *Polypodium dichotomum.* It is uncertain whether the Malayan plant which has a still earlier name is identical with this species or not.† In any case the American

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* Commencing with Raddi, followed by Hooker (Sp. Fil. 1: 11,12. 1844), *Mertensia glaucescens* H. & B. has been reduced to synonymy with this species, without taking the trouble to examine Willdenow's type. The species proves to be a member of a distinct section (*Holopterygium*) from the present species and is to be compared with the glaucous species of that section more recently described from South America. The type locality of *M. glaucescens* is Santa Cruz, Venezuela.

† The Malayan plant has been called *Gleichenia linearis* and has the following synonymy:

Dicranopteris linearis (Burm.)

Polypodium lineare Burm. Fl. Ind. 235. *pl.* *67. f. 2.* 1768. (type from Java); not *Polypodium lineare* Thunb. which belongs to a distinct family, but as a homonym will require a new name when placed in its proper genus.

Gleichenia linearis Clarke, Trans. Linn. Soc. II. 1: 428. 1880.

species, which has a relatively large range, is distinct from either the Japanese or Malayan species, and has already been twice named.

With this general account of the genus and its sections we present a preliminary synopsis of the North American species:

Primary branches bipinnate. (§ *Diplopterygium* Diels.)
  Pinnules contiguous, mostly alternate. 1. *D. Bancroftii.*
  Pinnules distant, mostly (?) opposite. 3. *D. Brunei.*
Primary branches simply pectinate or again (sometimes repeatedly) forking.
  Branches all naked up to the final pair of pectinate pinnae.
    With a pair of reflexed pinnae at each fork. (§ *Heteropterygium* Diels.) 7. *D. flexuosa.*
    Without reflexed pinnae at the forks. (§ *Acropterygium* Diels.)
      Ultimate pinnae sessile. 15. *D. pectinata.*
      Ultimate pinnae stalked (*i. e.*, the rachises naked at the base).
        Rachises zigzag, with reflexed segments. 17. *D retroflexa.*
        Rachises straight, with horizontal segments. 16. *D. pteridella.*
  Branches (some or all) pectinate; pinnae pinnatifid to the base. (§ *Holopterygium* Diels.)
    Once forked, the forks of the second and successive orders appearing like a bipinnatifid leaf; sinuses between the teeth broad. 13. *D. orthoclada.*
    Twice to four times forked.
      Primary internode (*i. e.*, stem between 1st and 2d fork) naked.
        Under surface more or less tomentose. 5. *D. cubensis.*
        Under surface smooth or at most faintly pubescent; rachises mostly scaly.
          Pinnae narrow (under 3 cm. wide); mostly 4-forked.
            Scales of axillary buds dark-fulvous; segments granular-glaucous beneath. 4. *D. costaricensis.*
            Scales of axillary buds pale-brown; segments faintly pubescent beneath, not glaucous. 11. *D. jamaicensis.*
          Pinnae wider (3.5–5 cm.).
            Under surfaces glaucescent; rachises densely-covered with pale spreading scales. 2. *D. bicolor.*
            Under surfaces faintly pubescent; rachises with scattered scales.
              Scales of axillary buds dark-fulvous; scales of ultimate rachises with dark centers. 12. *D. mellifera.*

Scales of axillary buds pallid; scales of ultimate rachises uniformly pale. 14. *D. palmata.*

Primary internode naked on the outside, at least below.
  Pinnae narrow, 2 cm. or less wide.
    Under surface thickly set with short erect reddish clavate bodies giving a granular appearance; primary internodes 2 cm. or less long. 6. *D. farinosa.*
    Under surface smooth or glaucous-mealy, pale; primary internodes longer, 4–5 cm. long. 18. *D. strictissima.*
  Pinnae wider, 2.5–6 cm.
    Under surfaces slightly pubescent; ultimate rachises densely scaly. 9. *D. furcata.*
    Under surfaces tomentose; ultimate rachises tomentose at first, becoming smooth. 8. *D. fulva.*
Primary internode (if any) fully pectinate; segments contiguous; primary axis prominent, producing (apparently) lateral branches. 10. *D. intermedia.*

LIST OF THE NORTH AMERICAN SPECIES

1. **Dicranopteris Bancroftii** (Hook.).

Gleichenia Bancroftii Hook. Sp. Fil. **1**: 5. *pl. 4 A.* 1844.

TYPE LOCALITY: Jamaica, *Bancroft.*

DISTRIBUTION: Mountains of Jamaica at altitudes of about 1200–1500 meters; also in Costa Rica, Colombia, Venezuela, Ecuador, and Bolivia.

ICON: Hooker, *loc. cit.*

This species was properly distinguished from the Old World representatives of the *longissima* group by Hooker, and this just opinion was abandoned when he cast all rational ideas of geographic distribution aside, and as well all rational conceptions of species limitations. The species is a most graceful plant in spite of its large size; it often forms sprays four or five meters long overhanging dry banks. Its allies are discussed in the footnote on page 249.

2. **Dicranopteris bicolor** (Christ).

Gleichenia bicolor Christ, Bull. Herb. Boiss. II. **6**: 279. 1906.

TYPE LOCALITY: Valle del Rio Navarro, Costa Rica, *Wercklé.*

DISTRIBUTION: Known only from the mountains of Costa Rica, alt. about 1400 meters.

This very distinct species was first collected by J. J. Cooper and was referred by Mr. Baker to the all-embracing *Gleichenia pubescens*, as "a large glabrous form." From Cooper's fragment we had recognized a plant unique and distinct from any known species as early as 1898; the material then at hand was too meager for description.

3. **Dicranopteris Brunei** (Christ).

Gleichenia Brunei Christ, Bull. Herb. Boiss. II. 5: 13. 1905.

TYPE LOCALITY: El Desengano, Costa Rica, *Brune*.

DISTRIBUTION: Known only from its type collection. Dr. Christ has kindly favored me with a part of spray which appears to be rather close to *D. Bancroftii*.

4. **Dicranopteris costaricensis** sp. nov.

A flabellate, 3–4-forked plant with narrow pinnae. Rootstock creeping; main stalk slender, 2 mm. in diameter, smoothish or with scattered scales; primary forks diverging at an angle of 100°, the primary internodes 4–8 cm. long, with 1 or 2 small obtuse lobes at the base; terminal bud large with dark-brown, ciliate-margined scales, sometimes forming a forking of the second order; secondary branching diverging at an angle of 80°–90°, the secondary internodes 4–6 cm. long, pinnate on one or both sides in the lower half; tertiary branching at an angle of 40°–60°, the internodes 5–6 cm. long, uniformly pinnate throughout, sometimes not forming a quaternary fork; pinnae 12–20 cm. long, 1.25–2 cm. wide, the segments short, glaucous underneath, with strongly revolute margins; veins once forked; rachises more or less densely covered underneath with delicate brown ciliated scales; sporangia in 3's or 4's.

Type from Costa Rica, Volcan Poas, alt. 2600 meters, *J. Donnell Smith 6859;* Volcan de Turrialba, alt. 2800 meters, *Pittier* (*J. D. S. 7486*).

This very distinct Costa Rican species has been confused by nearly every writer with *Gleichenia revoluta* H. & B., a species described from Ecuador, which differs materially in its narrower pinnae, different vestiture of the segments, and different bud-scales and decurrence of the segments on the internodes.

5. **Dicranopteris cubensis** sp. nov.

A straggling plant of wayside banks, with stems a meter or more high. Rootstocks wide-creeping, slender; 3-forked at the first branching, 2-forked at the second; primary internodes 3.5–4.5 cm. long, naked with more or less appressed pubescence, the buds rather large with small pallid finely ciliate scales; secondary internodes about equal length, sometimes nearly naked, but sometimes with segments decurrent from the tertiary forks one-half to two thirds the length; pinnae 25–30 cm. or more long, 5–7 cm. wide, the segments narrow, widening at the base, separated by 2–3 times their width, smooth above, covered beneath with a fine pure white appressed tomentum in which the sori are embedded; veins forked, mostly near the base, distinct; sporangia mostly in 3's and 4's.

On clay banks, slopes of El Yunque, near Baracoa, Cuba, *Underwood & Earle 1416* (type), *1196*; also collected by *Wright 921* (in part), *1810*.

6. **Dicranopteris farinosa** (Kaulf.).

Mertensia farinosa Kaulf. Wesen der Farrenkr. 37. 1827.

Mertensia subtrisperma Fée, Mém. Foug. **11**: 122. *pl. 32. f. 2.* 1866. (Type from Guadeloupe.)

TYPE LOCALITY: "Deren Vaterland ich nicht kenne"—*Kaulfuss.*

DISTRIBUTION: Known only from the island of Guadeloupe.

ILLUSTRATIONS: Kunze, Anal. Pterid. 6. *pl. 3.* 1837; Fée, *loc. cit.*

This is another characteristic species that has been strangely misunderstood in spite of the two excellent illustrations cited above, both of which call attention particularly to the very unique covering of the under side of the segments which we have seen in no other species of the family. Under the name *Gleichenia farinosa* or *Mertensia farinosa* it has been mistakenly reported from all the greater Antilles. It appears very rarely in collections and has probably a limited range on the islands of the Lesser Antilles. Although Kaulfuss was not aware of its original place of collection, his figure in Kunze's *Analecta* is unmistakable and it is more than probable that he found his specimen among some of the plants brought in by Sieber's collectors.

7. **Dicranopteris flexuosa** (Schrad.).

Mertensia flexuosa Schrad. Goett. Gel. Anz. 863. 1824.

Mertensia rigida Kunze, Linnaea **9**: 16. 1834. (Type from Chibangata, Peru, *Poeppig.*)

Gleichenia flexuosa Mett. Ann. Lug. Bat. **1**: 50. 1863.

Gleichenia rigida Bommer & Christ. Bull. Soc. Bot. Belg. **35**: 174. 1869. Not *Gleichenia rigida* J. Sm.

TYPE LOCALITY: Brazil, *Maximilian Prinz Neuwied.*

DISTRIBUTION: Lower elevations up to 800 m. alt., Porto Rico, Cuba, Jamaica, and southward from Colombia along the Andes to Peru and Brazil.

ILLUSTRATION: Mart. Icon. Crypt. Bras. *pl. 60. f. 1.*

This is the American representative of a rather complicated group of plants that have been unceremoniously massed under the name of *Gleichenia dichotoma.* This last species was described and figured from Japan by Thunberg as *Polypodium dichotomum* and may be distinct from the earlier Malayan representative of the group described by Burmann as *Polypodium lineare.* In any case the Malayan representative will bear the name *Dicranopteris linearis* (Burm.) as noted above. The fibro-vascular bundles of the last-named species are wiry and elastic and are used by the Malayans for weaving hats or hat frames and other articles. The Javan species is much larger than its low American representative and this accounts in part for the confusion which has placed several Old World species ranging from Hawaii and Japan to Java, Nepal, Madagascar and Fernando Po in one species, when there are certainly several as indicated by their mummied fragments preserved in European herbaria.

8. **Dicranopteris fulva** (Desv.).

Mertensia fulva Desv. Ann. Soc. Linn. Paris **6**: 200. 1827.

This commonest species of the island of Jamaica has been in recent years strangely confused with the *Mertensia pubescens* of Willdenow, which was originally described from South America. It was characterized in 1827 by Desvaux in the following terms which appear unmistakable:

> "Stipite et rachi dichotomo glabris; frondibus pinnatis; pinnis per dichotomiam decurrentibus, pectinato-pinnatifidis: pinnulis linearibus, elongatis, subobtusis, subtus fulvo-tomentosis; sporangiis subquaternatis. Habitat in montibus ceruleis Jamaicae."

The Hookerian school, Grisebach, and Jenman all confused this species with *Mertensia pubescens,* notwithstanding the fact that Sturm as early as 1859 had definitely delimited that much smaller South American species which Willdenow himself had described as "*subtus albido villosis,*" to say nothing of numerous other characters.

The present species forms immense thickets on banks and overgrows paths that are long neglected. Its general habit may be seen from a photograph taken last year in Porto Rico by Dr. M. A. Howe which is here reproduced by the courtesy of the New York Botanical Garden (FIGURE 2). This is the species alluded to above (page 244) at the Tweedside plantation, Jamaica.

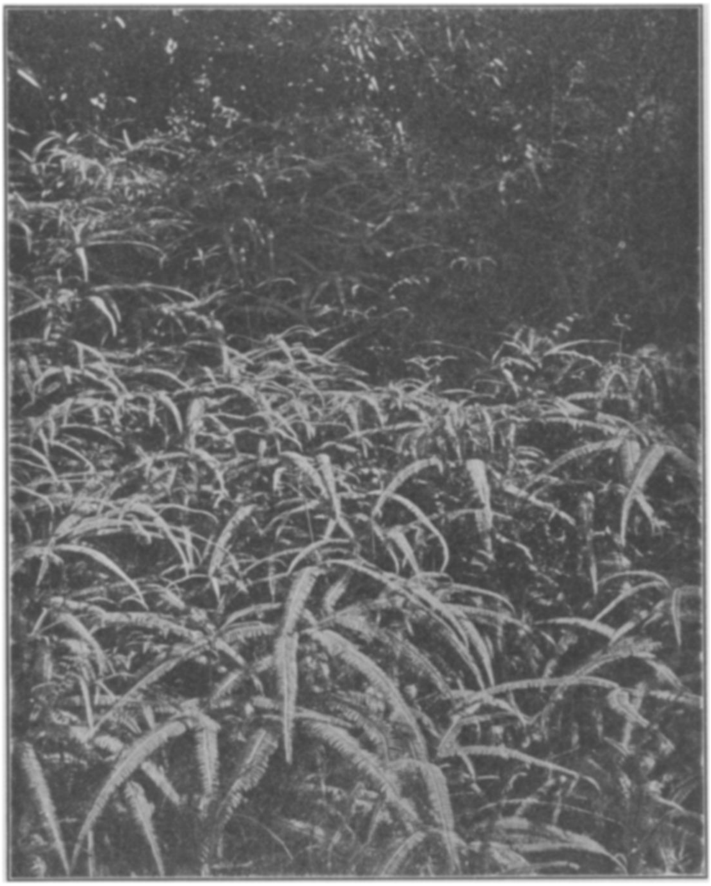

FIG. 2. Bank covered with *Dicranopteris fulva*, Porto Rico. (Courtesy of the *Journal of the New York Botanical Garden.*)

DISTRIBUTION: Cuba, Jamaica, Porto Rico, Hispaniola, and in

Mexico from Orizaba and Chiapas southward to Guatemala, Costa Rica and Panama. It is not always possible to cite specimens from the miserable fragmentary tips which even some of the recent collectors bring back to herbaria after a laborious and expensive journey to add to the knowledge of our tropical flora.

9. **Dicranopteris furcata** (L.).

Pteris dichotoma L. Sp. Pl. 1076. 1753. Not *Dicranopteris dichotoma* Bernh.

Acrostichum furcatum L. Syst. Nat. ed. 10. **2**: 1321. 1759. (Based on Plumier *pl. 28*, the same as had previously served as the type of *Pteris dichotoma*.)

Polypodium furcatum Sw. Jour. Bot. Schrad. **1800**^{2}: 28. 1801.

Gleichenia furcata Spreng. Syst. Nat. **4**: 25. 1827.

Mertensia furcata Willd. Vet. Ak. Nya Handl. 166. 1804.

Mertensia grandis Fée, Mém. Foug. **9**. 31. 1857 (nomen nudum); Mém. Foug. **11**: 120. 1866. (Type from La Soufrière, Guadeloupe.)

Rootstock unknown; upright stems stout, 5–6 mm. in diameter, covered above and when young with copious pale lanceolate scales; primary branches forming an angle of 80°, with one or two pinnae on either side at the base of the internode, which is 3 cm. long and scaly like the main stalk; occasionally forming a secondary branch with the second internode 6 cm. or more long, fully pinnate on both sides; pinnae 12–20 cm. long, 4.5–6.5 cm. wide in the middle, narrowed slightly toward each end, elliptic, the segments about 3 mm. wide, tapering mainly near the tips; under surfaces nearly smooth except the rachises which are densely scaly.

TYPE LOCALITY: Morne de la Calebasse, Martinique; based on Plumier, *pl. 28*.

DISTRIBUTION: Craters of extinct volcanoes [Martinique], Guadeloupe, and St. Kitts (Mt. Misery, *Britton & Cowell 526*).

ILLUSTRATION: Plumier, *loc. cit.*

This species has been strangely misunderstood and until the collection of fresh material by Britton and Cowell in 1900 it was impossible to correlate the species with other collections, especially of the *Mertensia grandis* Fée, which we have since seen in his collection and which was evidently based on plants with rather longer pinnae. The plants from St. Kitts exactly match the illustration from Plumier. The plant has not recently been collected in Martinique and is not likely ever to be collected there again. It should be sought at the summits of the higher volcanic islands of the Lesser Antilles. In St. Kitts it goes by the name of "stag-horn fern."

By strangely following somebody's error, Christensen * refers *Mertensia grandis* to *Gleichenia Bancroftii* (*Dicranopteris Bancroftii*), a member of a distinct section of the genus.

10. **Dicranopteris intermedia** (Baker).

Gleichenia intermedia Baker, Jour. Bot. **25**: 24. 1887.

Gleichenia axialis Christ, Bull. Herb. Boiss. II. **5**: 14. 1905.

(Type from Rio Navarro, *Wercklé.*)

TYPE LOCALITY: Costa Rica, *J. J. Cooper.*

DISTRIBUTION: Costa Rica.

Dr. Christ in some way formed the impression that Baker's species was "une espèce évidemment alpine," whereas Cooper's collection was from near Cartago and not far from the type locality of *G. axialis*, which is without question a redescription of Baker's plant. It really does prevent errors to visit Kew, but it is hard to convince continental fern students of that fact.

11. **Dicranopteris jamaicensis** sp. nov.

A mountain species with narrow pinnae much forked, sometimes proliferous and forming low thickets. Rootstocks creeping, frequently branched with abundant brownish scales; stems erect, 25–60 cm. long, 2–4-forked; buds densely covered with pale-brown ciliate scales; primary internodes naked or with a very few small segments on the inner side at base, scaly at first, becoming smooth and shiny, 3–9 cm. long; secondary internodes nearly naked or more often with segments on both sides below or all the way up, densely scaly as are the rachises with narrow pale-brown ciliate scales; tertiary internodes fully pectinate; pinnae 16–22 cm. long, rarely more than 2 cm. wide, with numerous closely placed segments separated by less than their width; under surfaces smooth, veins distinct, once forked, a third above the base; sori pale, in 3's and 4's.

Blue Mountains of Jamaica, *Underwood 1511* (type), *508, 919, 2500, 2552, 3209*; *Maxon 2617*; also collected by *Jenman, Hart* and others.

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* Index Filicum 423. 1906.

Confused by Jenman with *Gleichenia Matthewsii* Hook., a Peruvian species with a widely different vestiture throughout.

12. **Dicranopteris mellifera** (Christ).

Gleichenia mellifera Christ, Bull. Herb. Boiss. II. **6**: 28. 1906.

TYPE LOCALITY: Valle del Rio Navarro, Costa Rica, *Wercklé*.

DISTRIBUTION: Known only from Costa Rica.

13. **Dicranopteris orthoclada** (Christ).

Gleichenia orthoclada Christ, Bull. Herb. Boiss. II. **5**: 16. 1905; *ibid.* **6**: 282. 1906.

Gleichenia intermedia dissitifolia Baker, Jour. Bot. **25**: 24. 1887. (Type from Costa Rica, *J. J. Cooper.*)

TYPE LOCALITY: Costa Rica, *Wercklé 212.*

DISTRIBUTION: Known only from Costa Rica.

14. **Dicranopteris palmata** (Schaffner) sp. nov.

Mertensia palmata Schaffner; Fée, Mém. Foug. **9**: 32. 1857 (*nomen nudum*).

Gleichenia palmata Moore, Ind. Fil. 380. 1862 (*nomen nudum*).

A smoothish species with upright stems 3–4-forked, the primary and secondary internodes naked, the ultimate pinnae diverging at an angle of about 30°. Rootstock creeping, sending up strict branches (stems) 60 cm. or more high, the upper portion 4–6 mm. in diameter, smooth, olive-brown; primary branches diverging at an angle of 90°, 7–8 cm. long, naked except for a few scattering scales; secondary branches diverging at an angle of 60°, the internodes 3.5–4 cm. long, with a pair of bracts at the base and a line of linear scales along the inner side, otherwise naked; tertiary branches diverging at an angle of 30°–40°, the internodes 5–6 cm. long, pinnate on both sides throughout; quaternary and final branches forming an angle of 30°, the pinnae 20–25 cm. long, 3 cm. wide, tapering gradually to the point; segments 2.5 mm. wide, the margin often finely revolute, blunt, with a few scattered hairs beneath; sporangia in 3's or 4's; rachises pale reddish-brown with scattered ciliate scales.

Type from moist woods, Orizaba, Mexico, *Pringle 6129;* also collected by *Liebmann*, *Schaffner*, and *Bourgeau;* also common at 1500 m. in the Blue Mountains of Jamaica, occurring singly and not forming thickets like the allied species.

This species was first recognized by Schaffner as distinct and given a manuscript name which was published but not described by Fée under *Mertensia* and transferred by Moore to *Gleichenia;* although the plant has thus been known for nearly fifty years it has remained undescribed. The plant was distributed by Mr. Pringle as "a smooth form" of *Gleichenia pubescens*, but has nothing to do with the species distributed by him under that name in the collection of the same year (*no. 6130*). The Jamaica plants which we are unable to distinguish from the Mexican occur at points above Morce's Gap on the trail to John Crow Peak and above Cinchona on the road to New Haven Gap. Jamaica collections in the herbarium of the New York Botanical Garden are as follows: *Clute 184*, *Underwood 618*, *965*, *1245*, *2033*, *2097*, and *3138*. Mr. Jenman confused this species with *Gleichenia furcata*, to which species, as properly understood, it is not closely related.

15. **Dicranopteris pectinata** (Willd.).

Mertensia pectinata Willd. Vet. Ak. Nya Handl. 168. *pl. 4.* 1804.

Gleichenia pectinata Presl, Rel. Haenk. **1**: 71. 1825.

TYPE LOCALITY: Caracas, Venezuela.

DISTRIBUTION: Generally distributed through tropical America. Specimens are at hand from Jamaica, Hispaniola, Porto Rico, Dominica, St. Vincent, Martinique, Guadeloupe, Grenada, Trinidad, Guatemala, and Panama; also from Colombia, Guiana, Ecuador, Bolivia, and Brazil.

16. **Dicranopteris pteridella** (Christ).

Gleichenia pteridella Christ, Bull. Herb. Boiss. II. **6**: 284. 1906.

TYPE LOCALITY: Costa Rica, *Werklé.*

DISTRIBUTION: Known only from its type collection.

17. **Dicranopteris retroflexa** (Bommer).

Gleichenia retroflexa Bommer, Bull. Soc. Bot. Belg. **35**: 175. 1896.

Gleichenia intermedia flexuosa Baker, Jour. Bot. **25**: 24. 1887. (Type from Costa Rica, *J. J. Cooper*).

TYPE LOCALITY: La Palma, Costa Rica, *Pittier 1471.*

DISTRIBUTION: Known only from the mountains of Costa Rica, alt. 1800 m.

ILLUSTRATIONS: Christ, Bull. Herb. Boiss. II. **5**: 15. 1905.

This remarkable species was first described by Mr. Baker, in

1887. Having already described a new species (*Gleichenia intermedia*) from the collections of J. J. Cooper, he evidently lost courage upon finding two others in the same collection undescribed and referred them both, as varieties, to his *G. intermedia*. One of these is *D. orthoclada*, described by Dr. Christ, and the other is the present species, which is the most peculiar of all the anomalies in a strange genus. We were at first inclined to regard the scrappy material collected by Cooper as a sport, but ample material collected by Mr. Maxon places us in the possession of a sufficient illustration of the species to doubt its normality no longer.

18. **Dicranopteris strictissima** (Christ).

Gleichenia strictissima Christ, Bull. Herb. Boiss. II. **5**: 13. 1905.

Gleichenia glaucina Christ, Bull. Herb. Boiss. II. **6**: 283. 1906. (Type from Navarro, Costa Rica.)

TYPE LOCALITY: Costa Rica, *Wercklé 215*.

DISTRIBUTION: Known only from Costa Rica, alt. 1450–1550 meters.

With specimens communicated from Dr. Christ before us, we are not able to separate these two species. Wercklé's specimens, unfortunately, do not give us good representatives of the species. More recently however Mr. Maxon has gathered some beautifully preserved specimens from La Palma (*no. 432*); these are of the *glaucina* type being strikingly glaucous beneath, a character on which too much reliance should not be placed in separating the members of this genus. The original *G. strictissima* has smooth but not glaucous under surfaces, but seems to differ in no other way.

SPECIES INQUIRENDAE

MERTENSIA GLEICHENIOIDES Liebm. Mex. Bregner 144. 1849. (Type from Cuapa, Dept. Vera Cruz, Mexico, *Liebmann*.)

Gleichenia Leibmanni Moore, Ind. Fil. 379. 1862.

This species we have never seen. A tracing of a single fork appears in the collection of Mettenius at Berlin, and shows a narrow elongate pinna with crenately lobed segments wholly unique in the genus. It is only known from its type collection, and Mr. Christensen, who is at the Copenhagen museum where

Liebmann's types should be, places it among the little-known species.

GLEICHENIA TRACHYRHIZOMA Christ, Bull. Herb. Boiss. II. **6**: 280. 1906. (Type from Valle del Rio Navarro, 1,400 meters, *Wercklé.*)

GLEICHENIA BREVIPUBIS Christ, Bull. Herb. Boiss. II. **6**: 280. 1906. (Type from Valle del Rio Navarro, Costa Rica, alt. 1,400 meters, *Wercklé.*)

Although Dr. Christ has sent fragments of these two Costa Rican species we are unable to differentiate them satisfactorily in our synopsis, as they do not show distinctive characters; Wercklé's specimens are poorly preserved and do not show essential parts of the plants.

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